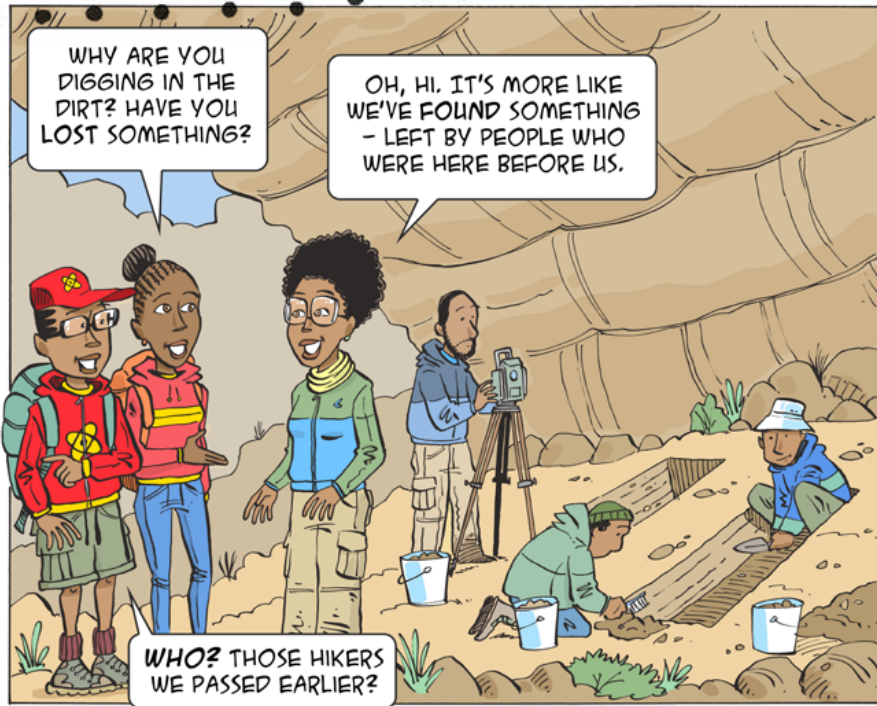


SCIENCE SPAZA

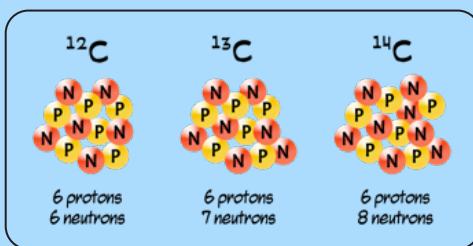
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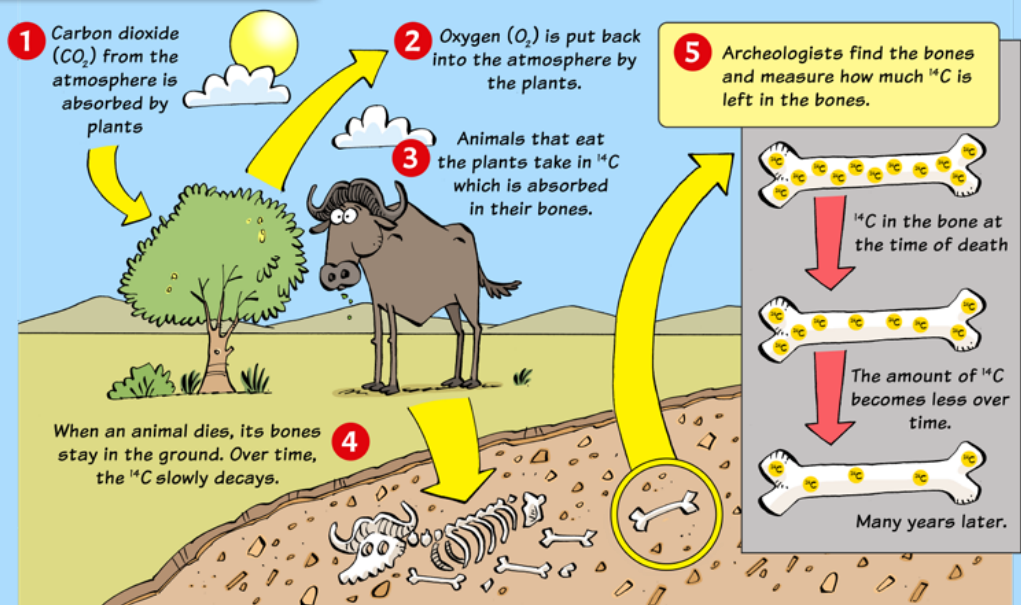
RADIOCARBON DATING - TICK-TOCK THE CARBON CLOCK!



INTRO TO RADIOCARBON DATING



All living things absorb carbon until the moment they die. Carbon usually has 6 protons and 6 neutrons. So we call it ^{12}C . But sometimes special carbon is formed by radiation from outer space. It's called ^{14}C with 2 extra neutrons. ^{14}C slowly breaks down into nitrogen when one of the neutrons becomes a proton. It's called radiocarbon dating and it helps us answer questions about the past.



SO WE CAN TELL WHEN SOMETHING DIED BY COMPARING HOW MUCH ^{12}C AND ^{14}C THERE IS IN IT. IT'S CALLED **RADIOCARBON DATING** AND IT HELPS US ANSWER QUESTIONS ABOUT THE PAST.

Knowledge is Ncaw!



CREATE YOUR OWN MINI-DIG

ARCHAEOLOGISTS LEARN ABOUT THE PAST FROM THE ITEMS, OR **ARTEFACTS**, THAT PEOPLE LEAVE BEHIND. THIS IS CALLED **EXCAVATION** OR A '**DIG**'.



YOU WILL NEED:

- A CLEAR PLASTIC BOTTLE WITH THE TOP CUT OFF OR A GLASS JAR.
- DIFFERENT KINDS OF SOIL.
- "ARTEFACTS" - THESE COULD BE A PIECE OF CHARCOAL, BEADS, LEAVES OR STICKS.
- NOTE-BOOK AND PEN.
- BRUSH OR SPOON.



- 1** FILL THE BOTTLE WITH LAYERS OF SAND. YOU CAN USE THE TOP OF THE BOTTLE AS A FUNNEL.



- 2** PLACE AN ARTEFACT IN EACH LAYER. YOU COULD PUT LETTERS (OR WORDS) IN THE BOTTLE AT DIFFERENT LEVELS TO SPELL OUT A WORD OR SEND A MESSAGE. YOU HAVE TO EXCAVATE CAREFULLY TO GET THEM OUT IN THE RIGHT ORDER.



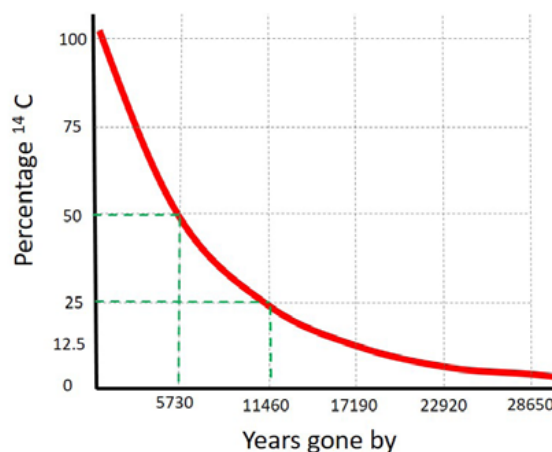
- 3** SWOP YOUR BOTTLE WITH A FRIEND AND START EXCAVATING! REMEMBER ARCHAEOLOGISTS ALWAYS CAREFULLY RECORD EVERYTHING THAT THEY FIND.



WHAT'S HAPPENING HERE?

THE SOIL LAYERS, OR **STRATIGRAPHY**, TELL US APPROXIMATELY HOW OLD OBJECTS IN DIFFERENT LAYERS ARE COMPARED TO EACH OTHER. IT'S CALLED **RELATIVE DATING**.

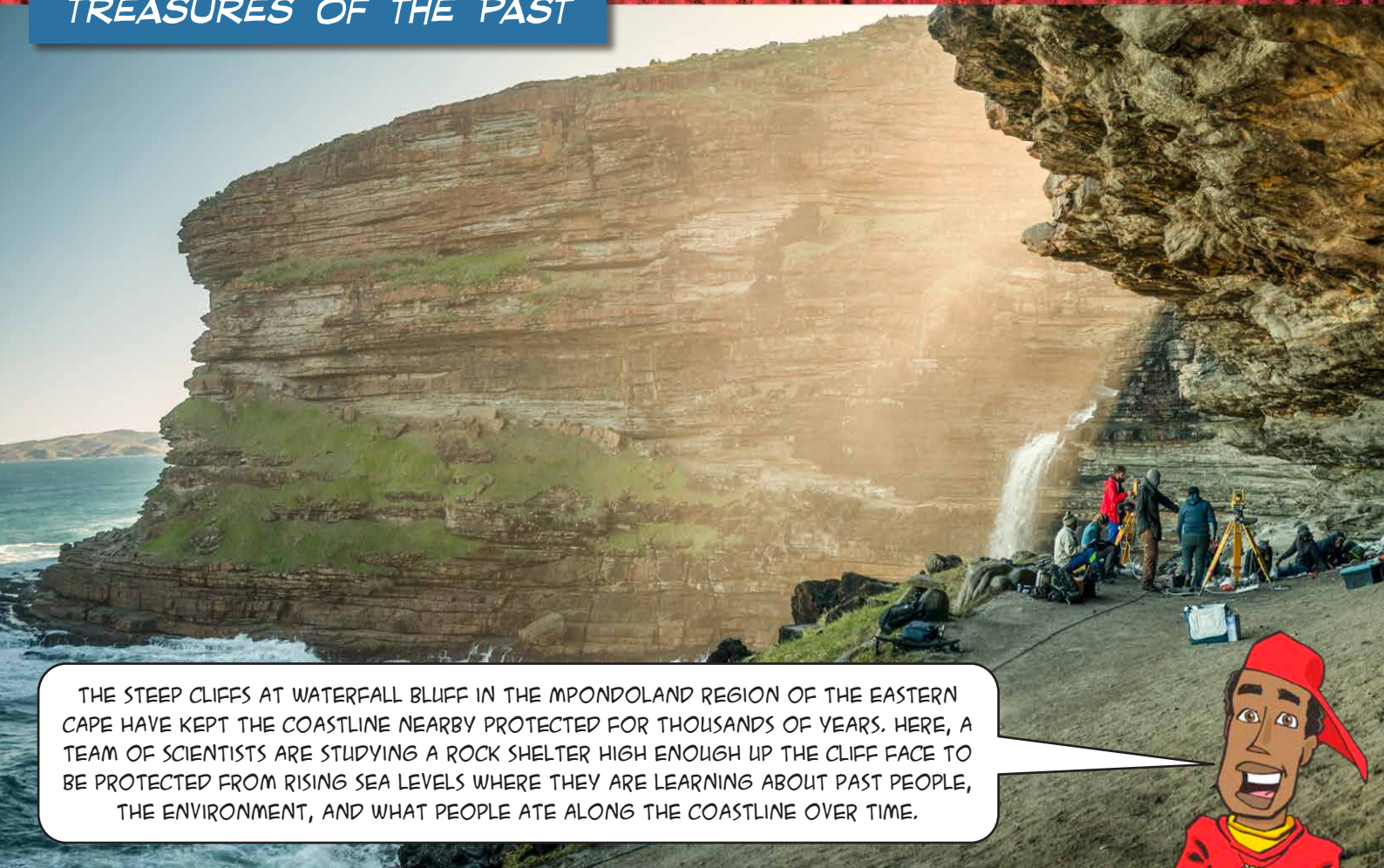
RADIOCARBON DATING CAN HELP US FIND A LAYER'S **EXACT AGE** - KNOWN AS "ABSOLUTE DATING" - BY COMPARING ^{12}C AND ^{14}C LEVELS IN A LABORATORY.



^{14}C breaks down at a very specific rate. After 5730 years, half of the original ^{14}C has decayed. This period is called the half-life and it helps archaeologists know how long ago something died.

For example, if an artefact has 25% of ^{14}C then we know it has halved, and halved again. So it dates back to $5730+5730 = 11460$ years!

TREASURES OF THE PAST



THE STEEP CLIFFS AT WATERFALL BLUFF IN THE MPONDOLAND REGION OF THE EASTERN CAPE HAVE KEPT THE COASTLINE NEARBY PROTECTED FOR THOUSANDS OF YEARS. HERE, A TEAM OF SCIENTISTS ARE STUDYING A ROCK SHELTER HIGH ENOUGH UP THE CLIFF FACE TO BE PROTECTED FROM RISING SEA LEVELS WHERE THEY ARE LEARNING ABOUT PAST PEOPLE, THE ENVIRONMENT, AND WHAT PEOPLE ATE ALONG THE COASTLINE OVER TIME.

FEATURED SCIENTIST AND CAREERS

Radiocarbon dating specialists have many career options in fields such as nanotechnology, biomedicine, forensics, the nuclear industry, research and, of course, archaeology.



Rivonigo Khosa is a junior research scientist at iThemba LABS, South Africa's leading radiocarbon dating facility. Her research looks at how landscapes, soil and rivers form over time by measuring isotopes.

Rivonigo is interested in isotopes formed by radiation from outer space called cosmogenic nuclides.

CURRICULUM LINKS

- *Gr 7-9 Mathematics:*
Drawing and interpreting graphs.
- *Grade 7-9 Natural Science:*
Periodic table, mass numbers and atomic numbers.
- *Grade 10-12 Physical Science:*
Atomic structure, isotopes and radioactivity.

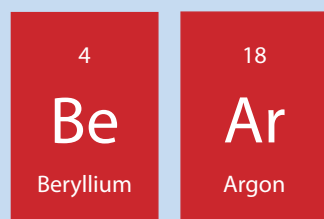
ISOTOPE FUN!

ISOTOPES ARE SPECIAL FORMS OF AN ATOM WITH EXTRA OR MISSING NEUTRONS.

APART FROM CARBON, ISOTOPES OF SEVERAL OTHER ELEMENTS (SHADED RED HERE) ARE USED TO FIND THE AGE OF ARCHAEOLOGICAL OBJECTS.

HOW MANY WORDS CAN YOU MAKE USING THE SYMBOLS OF THESE ELEMENTS?

EXAMPLE:



= BEAR



CAN YOU FIND A 6 LETTER WORD?
CLUE: ALL LIVING THINGS CONTAIN THIS.

— — — — —

53 I Iodine	6 C Carbon	20 Ca Calcium	92 U Uranium	14 Si Silicon	38 Sr Strontium
4 Be Beryllium	3 Li Lithium	5 B Boron	8 O Oxygen	18 Ar Argon	19 K Potassium
17 Cl Chlorine	15 P Phosphorus	5 Pb Lead	7 N Nitrogen	26 Fe Iron	2 He Helium

START YOUR OWN SCIENCE SPAZA

Do you want to start a science club at your school? Send us the following information, and Science Spaza will contact you.

School: _____

Name: _____

Telephone number: _____

Email address: _____

Physical address: _____

Visit www.sciencespaza.org, email info@sciencespaza.org, SMS or WhatsApp us on 076 173 7130 or write to us at PO Box 22106, Mayor's Walk, 3208.

WE WANT YOUR FEEDBACK!

WE WOULD LOVE TO SEE PHOTOS OF YOUR MINI-DIG AND HEAR HOW MANY WORDS YOU COULD FIND. VISIT OUR SCIENCE SPAZA PAGE ON FACEBOOK, OR WHATSAPP US YOUR PICTURES ON 076 173 7130.



Work sponsored by the DSI-NRF (Department of Science and Innovation-National Research Foundation) Centre of Excellence in Palaeosciences Award Number (COEOP2020-1)

The P5 Project is an international and interdisciplinary collaboration of researchers studying human adaptations to coastal environments. More information about the P5 Project can be found at <https://p5project.org>, via facebook at <https://www.facebook.com/pfiveproject/>, via twitter at <https://twitter.com/p5project> and on YouTube.

